

Deep Creek Chinook Salmon Escapement Survey, 2014-2018

by

Carol M. Kerkvliet

and

Michael D. Booz

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code		all standard mathematical signs, symbols and abbreviations	
deciliter	dL		AAC		
gram	g	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H _A
hectare	ha			base of natural logarithm	<i>e</i>
kilogram	kg	all commonly accepted		catch per unit effort	CPUE
kilometer	km	professional titles	e.g., Dr., Ph.D., R.N., etc.	coefficient of variation	CV
liter	L			common test statistics	(F, t, χ^2 , etc.)
meter	m	at	@	confidence interval	CI
milliliter	mL	compass directions:		correlation coefficient (multiple)	R
millimeter	mm	east	E	correlation coefficient (simple)	r
Weights and measures (English)		north	N	covariance	cov
cubic feet per second	ft ³ /s	south	S	degree (angular)	°
foot	ft	west	W	degrees of freedom	df
gallon	gal	copyright	©	expected value	<i>E</i>
inch	in	corporate suffixes:		greater than	>
mile	mi	Company	Co.	greater than or equal to	≥
nautical mile	nmi	Corporation	Corp.	harvest per unit effort	HPUE
ounce	oz	Incorporated	Inc.	less than	<
pound	lb	Limited	Ltd.	less than or equal to	≤
quart	qt	District of Columbia	D.C.	logarithm (natural)	ln
yard	yd	et alii (and others)	et al.	logarithm (base 10)	log
Time and temperature		et cetera (and so forth)	etc.	logarithm (specify base)	log ₂ , etc.
day	d	exempli gratia (for example)	e.g.	minute (angular)	'
degrees Celsius	°C	Federal Information Code	FIC	not significant	NS
degrees Fahrenheit	°F	id est (that is)	i.e.	null hypothesis	H ₀
degrees kelvin	K	latitude or longitude	lat. or long.	percent	%
hour	h	monetary symbols (U.S.)	\$, ¢	probability	P
minute	min	months (tables and figures): first three		probability of a type I error (rejection of the null hypothesis when true)	α
second	s	letters	Jan.,...,Dec	probability of a type II error (acceptance of the null hypothesis when false)	β
Physics and chemistry		registered trademark	®	second (angular)	"
all atomic symbols		trademark	™	standard deviation	SD
alternating current	AC	United States (adjective)	U.S.	standard error	SE
ampere	A	United States of America (noun)	USA	variance	
calorie	cal	U.S.C.	United States Code	population sample	Var var
direct current	DC	U.S. state	use two-letter abbreviations (e.g., AK, WA)		
hertz	Hz				
horsepower	hp				
hydrogen ion activity (negative log of)	pH				
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

REGIONAL OPERATIONAL PLAN SF.2A.2014.09

DEEP CREEK CHINOOK SALMON ESCAPEMENT SURVEY, 2014-2018

By
Carol M. Kerkvliet Alaska
Department of Fish and Game, Division of Sport Fish, Homer
and
Michael D. Booz
Alaska Department of Fish and Game, Division of Sport Fish, Homer

Alaska Department of Fish and Game
Division of Sport Fish

August 2014

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*Carol M. Kerkvliet, and Michael D. Booz
Alaska Department of Fish and Game, Division of Sport Fish,
3298 Douglas Place, Homer, AK 99603-7942, USA*

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Project Title: Deep Creek Chinook Salmon Escapement Survey, 2014-2018

Project leader(s): Carol Kerkvliet, Fisheries Biologist II and Mike Booz, Fisheries Biologist I

Division, Region, and Area Sport Fish, Region II, Homer

Project Nomenclature:

Period Covered FY15 through FY19

Field Dates: July 27, 2014 to August 3, 2018

Plan Type: Category II

Approval

Title	Name	Signature	Date
Project leader	Carol Kerkvliet		7/23/14
Project leader	Mike Booz		7/24/14
Biometrician	David Evans		7/23/14
Research Coordinator	Tim McKinley		7/24/14

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PURPOSE

Alaska Department of Fish and Game (ADF&G) has monitored Chinook salmon escapement annually in Deep Creek using helicopter surveys from 1973 to present. The Deep Creek Chinook salmon sport fishery has been managed for a sustainable escapement goal (SEG) of 350 to 800 Chinook salmon. This SEG range is based on the 25th to 75th percentiles of annual helicopter survey counts made during peak spawning for the years 1976-2013.

Keywords: Chinook salmon, Deep Creek, aerial survey, salmon escapement.

BACKGROUND

Deep Creek is one of three streams within the Lower Cook Inlet Management Area that supports a Chinook salmon *Oncorhynchus tshawytscha* sport fishery. The Anchor River supports the largest wild Chinook salmon harvest, followed by Deep Creek, then the Ninilchik River. Chinook salmon return to these streams from approximately early May through late July.

The Alaska Department of Fish and Game has indexed Chinook salmon abundance in Deep Creek since 1962, in an area where the majority of spawning was thought to occur (Table 1). From 1962 through 1994, the index area and methods were not well documented. Since 1995, the index area has been from Cytex Creek to the the Sterling Highway Bridge (Figure 1), and the count has been made from a helicopter.

A variety of methods were used to survey Deep Creek prior to 1995. A fixed wing aircraft was used from 1962 through 1973; foot surveys of a sub-reach of the aerial flight path have been conducted from 1962 through 1994, and a helicopter has been used from 1973 to the present. The aircraft surveys were used in tandem with the foot surveys; documentation is scarce, but expansions of aerial counts were made based on ratios of foot to aerial counts. Reliable (helicopter) counts of a known index area have been made from 1995 to the present.

Since 2001, the Deep Creek Chinook salmon sport fishery has been managed for a sustainable escapement goal (SEG) range of 350 to 800 Chinook salmon. This SEG range is based on the 25th to 75th percentiles of annual helicopter survey counts made during peak spawning (Szarzi et al. 2010¹). Peak spawning is believed to be from late July through early August. Since 2000, the date of the annual survey has ranged from July 23 to August 3.

In 2013, the SEG was reanalyzed with the aerial survey data from 1976 through 2013 and it was recommended that there be no change in the SEG range. Since 2001, aerial index counts have fallen within the SEG range except for the 2008 count (Table 1).

OBJECTIVES

1. Index the spawning escapement of Chinook salmon in Deep Creek using a helicopter survey between 25 July and 4 August 2014-2018 such that each index represents a constant fraction of the escapement to the system and each index is comparable with previous years' indices of that system.

¹ Szarzi, N. J., C. M. Kerkvliet, B. J. Failor, and M. D. Booz. 2010 Recreational Fisheries in the Lower Cook Inlet Management Area, 2008-2010, with updates for 2007. Alaska Department of Fish and Game, Fisheries Management Report No. 10-38. Anchorage.

METHODS

DESIGN

Chinook salmon escapement in Deep Creek will be indexed from a helicopter during the peak spawning period, as determined through past escapement surveys in 2000-2013, and when viewing conditions are acceptable. Since 2000, the date of the annual survey has ranged from July 23 to August 3. Two observers will fly the survey. Each observer will wear polarized sunglasses to count the number of live and dead Chinook salmon observed from Cytex Creek (Latitude= 59° 56.848; Longitude = 151° 13.271) to the Old Sterling Highway Bridge (Latitude= 60° 1.785; Longitude = 151° 40.993) (Figure 1). The index area is divided into four reaches, which are identified in Figure 1 and on the data entry form (Table 2). Figures 2 to 5 identify the prominent landscape features used to identify reach breaks. Survey conditions will be recorded and will include the following: percent cloud cover, whether count was made in sunlight (direct, indirect, presence of shadows), wind conditions, precipitation, water clarity and water glare. An overall assessment of the survey conditions will also be recorded as poor, good or excellent.

The index count will be based on the surveyor count sitting in the front seat (primary surveyor) of the helicopter. The surveyor sitting in the back seat (secondary surveyor) is used as a backup in the event that the primary surveyor encounters difficulties counting (e.g. malfunctioning hand tally, motion sickness). The secondary surveyor count will only be used if there is an identifiable problem with the primary surveyor's count. The secondary surveyors role also serves as a training opportunity. During the survey, surveyors will not discuss their individual counts and will independently record their own counts.

The total count within the index area will be interpreted as a minimum number of spawning salmon escaping to Deep Creek and will therefore be viewed only as an index of total escapement. Such indices will be assumed to be positively related to total escapement (but in an unknown manner) and comparable among years within a stream. Trends of indexes over years will therefore be assumed to reflect trends in actual escapements.

DATA COLLECTION

Each surveyor will record the following data on a data entry form for each survey (Table 2):

1. Stream and the respective reach/tributary area surveyed.
2. Date and Time survey started and ended.
3. Type of survey (Primary/Secondary).
4. Survey Conditions
5. Total number of live salmon observed.
6. Total number of dead salmon observed.
7. Overall Survey Quality
8. Any pertinent comments

DATA REDUCTION AND ANALYSIS

The survey data will be summarized and will be presented in the Lower Cook Inlet Fisheries Management Report. The survey conditions, total number of live and dead Chinook salmon that were counted in each reach and stream will be recorded in historical stream files. Data entry forms will be filed in the area office stream files. The index data will be used every three years to review of the Deep Creek SEG.

SCHEDULES AND DELIVERABLES

Crew schedules from June through August 2014-2018.

Date	Activities
June	Schedule survey
July 23 to August 3	Conduct survey
August 3	Finalize index count
November 2016 and 2019	Report index counts in Fisheries Management Report

RESPONSIBILITIES

List of Personnel and Duties

Carol Kerkvliet, Fishery Biologist II, Project Leader- Duties: Author operational plan and administer the project budget. May conduct surveys

Michael Booz, Fishery Biologist I, May conduct aerial surveys. Responsible for summarizing data.

Tim Blackmon, Fishery Technician III- Duties: May conduct aerial surveys.

David Evans, Biometrician III- Duties: Review operational plan, advise project leader regarding statistical procedures and practices, and review draft report.

Budget

Projected FY2015 Costs ^a:

Line	Category	Total Budget (\$K)
100	Personnel Services	113.4
200	Travel	0.0
300	Contractual	17.6
400	Commodities	6.6
500	Equipment	0.0
Total		137.6

^a FY2016-FY2019 costs are expected to be similar to FY2015.

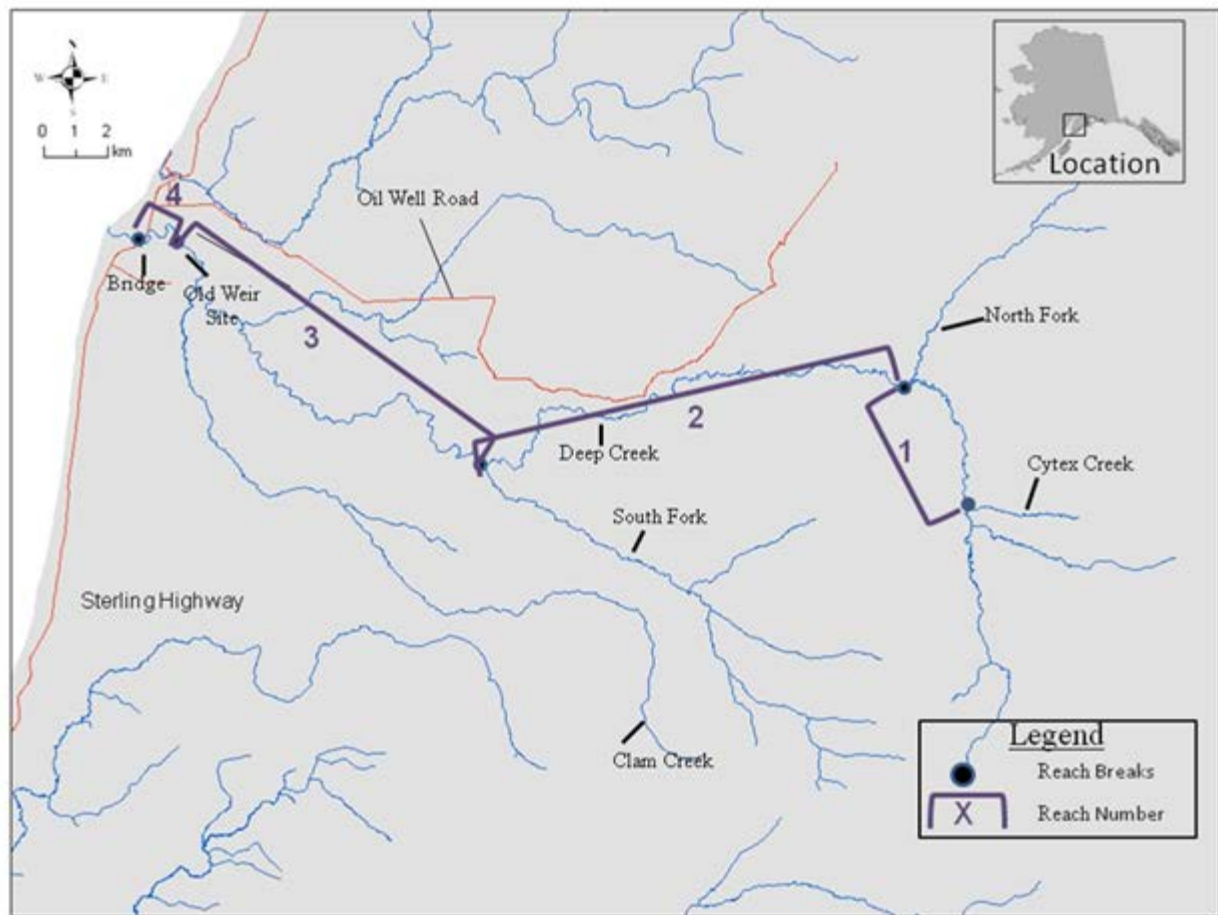


Figure 1.-Deep Creek Chinook salmon aerial survey index area.



Figure 2.- Start of index area at Cytex Creek (Reach 1, Latitude= $59^{\circ} 56.848$; Longitude = $151^{\circ} 13.271$).



Figure 3.- North Fork river marks the bottom of reach 1 and top of reach 2.

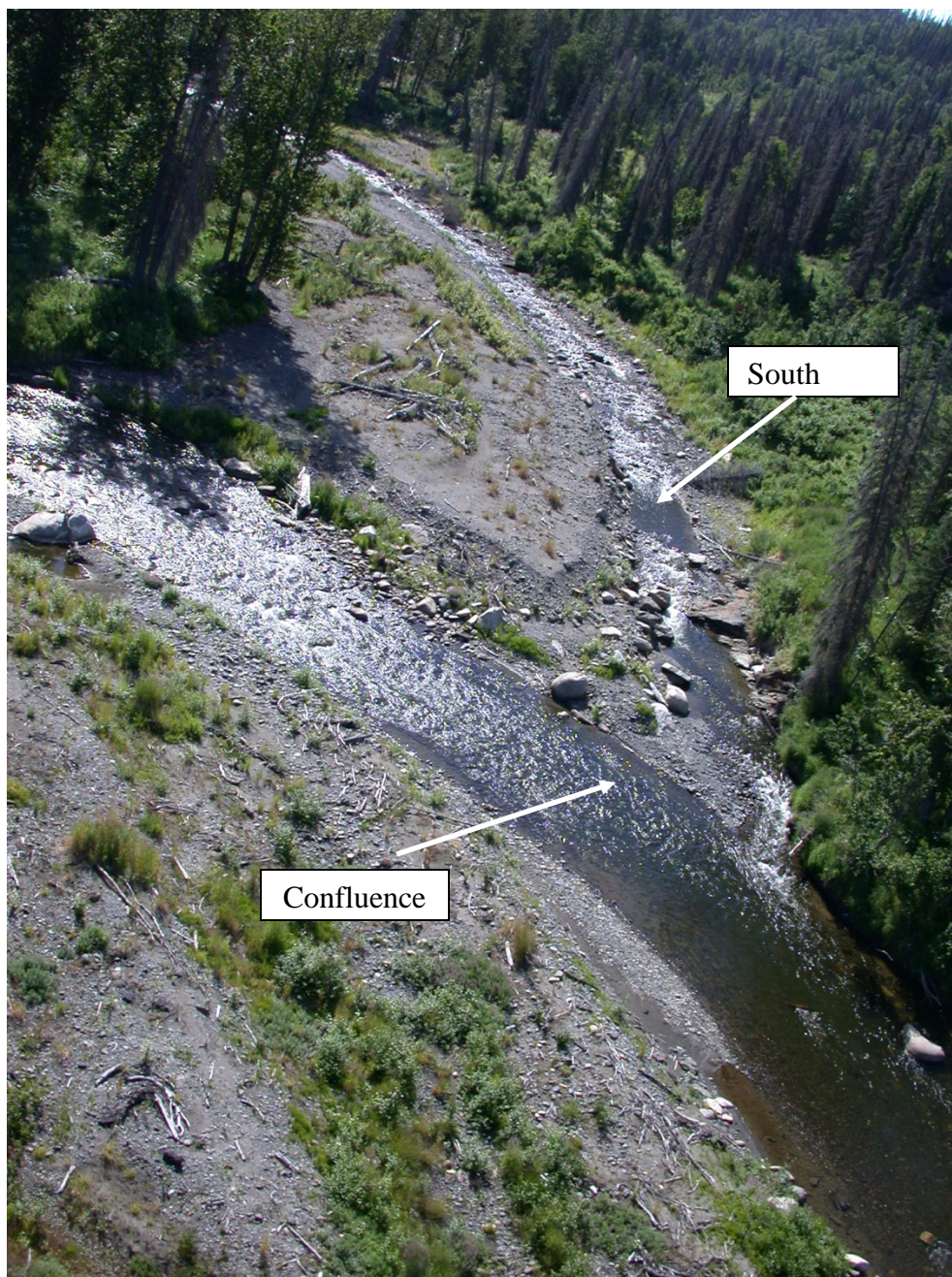


Figure 4.- North Fork and South Fork confluence marks the bottom of reach 2 and top of reach 3.



Figure 5.- Old weir site marks the bottom of reach 3 and top of reach 4.

Table 2 Chinook salmon aerial index count, Deep Creek, 1962-2013.

Year	Date	Aerial Total ^a	Year	Date	Aerial Total ^a
1962	04-Aug	400	1988	30-Jul	409
1963	10-Jul	89	1989	26-Jul	561
1964	27-Jul	399	1990	21-Jul	347
1965	02-Aug	425	1991	27-Jul	294
1966	27-Jul	NA	1992	10-Aug	63
1967	26-Jul	210	1993	22-Jul	486
1968	31-Jul	114	1994	30-Jul	364
1969	01-Aug	288	1995	^b 05-Aug	229
1970	NA	NA	1996	^b 02-Aug	193
1971	NA	NA	1997	^b 30-Jul	136
1972	NA	NA	1998	^b 28-Jul	676
1973	02-Aug	NA	1999	^b 28-Jul	1,190
1974	NA	NA	2000	^b 27-Jul	556
1975	NA	NA	2001	^b 28-Jul	551
1976	02-Aug	1,075	2002	^b 29-Jul	696
1977	27-Jul	848	2003	^b 23-Jul	1,008
1978	04-Aug	582	2004	^b 31-Jul	1,075
1979	29-Jul	726	2005	^b 25-Jul	1,076
1980	NA	NA	2006	^b 27-Jul	507
1981	30-Jul	427	2007	^b 27-Jul	553
1982	28-Jul	977	2008	^b 03-Aug	205
1983	29-Jul	550	2009	^b 28-Jul	483
1984	05-Aug	380	2010	^b 30-Jul	387
1985	09-Aug	644	2011	^b 28-Jul	696
1986	29-Jul	976	2012	^b 28-Jul	447
1987	28-Jul	968	2013	^b 03-Aug	475

NA=Not available

^a Aerial surveys from 1962-1974 were done from fixed wing aircraft (Super Cub); helicopter surveys from 1973 to present; foot surveys from 1962 through 1994 (used in tandem with aerial surveys).

^b Index Area -from Cytex Creek (Latitude= 59° 56.848; Longitude = 151° 13.271) to the Old Sterling Highway Bridge (Latitude= 60° 1.785; Longitude = 151° 40.993).

Table 2.- Aerial survey data entry form, Deep Creek Chinook salmon, 2014-2018.

Date :						
DEEP CREEK			Primary Surveyor:		Secondary Surveyor:	
			Live	Dead	Total	
Mainstem						
Cytex (59 56.848 151 13.271) to North Fork (Reach 1)						
North Fork to South Fork (Reach 2)						
South Fork to weir (Reach 3)						
Weir to Sterling Hwy. (60 1.785 151 40.993) (Reach 4)						
Subtotal						
Total						
Survey Start Time:						
Survey End Time:						
Survey Time:						
Survey Conditions						
Percent cloud cover:						
Sunlight:						
Precipitation:						
Water glare:						
Wind direction:						
Water clarity:						
Survey was flown at approximate average altitude:						
Overall Survey Quality (Poor, Good, Excellent):						
Comments:						